

# PATENT ABSTRACTS OF JAPAN

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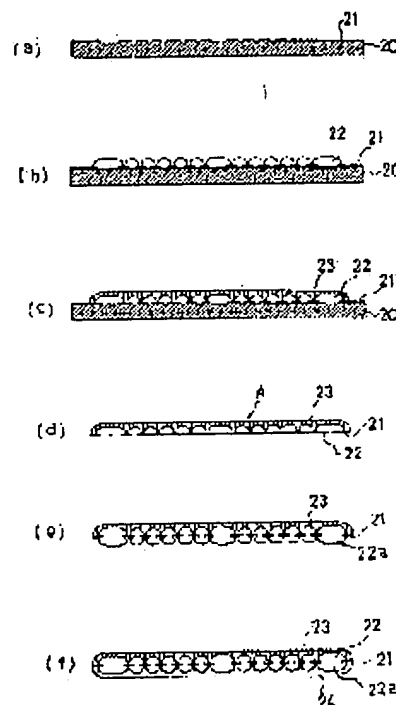
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## (54) MANUFACTURE OF THICK FILM WIRING SUBSTRATE

### (57)Abstract:

**PURPOSE:** To provide a thick film wiring substrate which can be simply separated without die stamping to obtain a large number of boards.

**CONSTITUTION:** A photoresist pattern 21 is formed on the surface of an aluminum substrate 20, and a copper plating layer 22 is formed thereon by electroplating. A coating film 23 of epoxy resin is formed on the copper plating layer by electrodeposition coating, and is heated and cured. The aluminum substrate is dissolved and removed to obtain a pattern plating formation A. Another copper plating layer 22a is formed on the copper plating layer, and a coating film 24 is formed thereon by electrodeposition coating. Two pattern plating formations A are heated and cure in such a way that the coating films 24 are superposed, and to obtain a pattern plating laminate B. Through holes are formed in specified points on the copper plating layers, and a copper plating layer is formed within the through holes to provide continuity between the upper and lower copper plating layers. The coating film is removed by excimer laser processing in the positions of electrode terminals to expose them.



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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the manufacture approach of the thick-film-wiring substrate which was applied to the manufacture approach of a thick-film-wiring substrate, especially fitted formation of a fine pattern.

[0002]

[Description of the Prior Art] the thick conductor of the thickness formed by the galvanizing method or the etching method -- the thick-film-wiring substrate equipped with the circuit is needed in the field of electronic parts, such as a big small coil of the operating current, a high density connector, and a high density wiring substrate, and the request of much more miniaturization of these electronic parts has become size especially with the miniaturization of electronic equipment in recent years. For this reason, a very FAIN thing called ten [ $\mu\text{m}$ ] or more also in the pitch of the conductor pattern of a thick-film-wiring substrate has been required. Conventionally, this kind of thick-film-wiring substrate was manufactured as shown in JP,2-19992,B. Below, drawing 4 and drawing 5 explain the outline of the production process. First, the desired photoresist pattern 2 is formed in sheet metal 1, such as aluminum, (refer to drawing 4 (a)), copper pyrophosphate plating liquid is used after that, and it is current density 5 A/dm<sup>2</sup>. The copper conductor pattern 3 of 15-200 micrometers of thickness is formed by five or more wiring consistencies/mm with electroplating (refer to drawing 4 (b)). Adhesives 5 are applied to both sides of the insulating substrate 4, and the sheet metal 1 of two sheets which prepared the copper conductor pattern on both sides of this insulating substrate 4 is made to fix by pasting up a conductor pattern on adhesives 5 (refer to drawing 4 (c)). Both sheet metal 1 and the insulating substrate 4 are firmly fixed by carrying out thermocompression bonding of both the sheet metal 1 to the insulating substrate 4 (refer to drawing 4 (d)).

[0003] It continues and the thick-film-conductor substrate F is obtained by making it dissolve in heat lye and removing both sheet metal 1 (refer to drawing 4 (e)). in order to connect the predetermined conductor of the copper conductor patterns 3 of both sides for this thick-film-conductor substrate F, a through hole 6 is established in a substrate (refer to drawing 5 (f)), and it flows through the inside of a through hole 6 by electroplating -- making -- both -- a conductor -- between is connected (refer to drawing 5 (g)). at this time, it galvanizes also to the copper conductor pattern 3 -- having -- thickness -- thick -- becoming -- a conductor -- resistance can be reduced. Furthermore, the cover coat film 7 for electric conduction film protection is formed in both sides of the thick-film-conductor substrate F except for the input terminal section (not shown) (refer to drawing 5 (h)). And many picking thick-film-conductor substrates F are pierced using metal mold, and it divides into each thick-film-conductor substrate (refer to drawing 5 (i)).

[0004]

[Problem(s) to be Solved by the Invention] However, in order to prepare the two-layer electric conduction wiring film and to make this unify, it is necessary to use thickness and a hard insulating substrate, and in the manufacture approach of the above-mentioned thick-film-wiring substrate, piercing

with sufficient dependability so that many insulating substrates and cover coat film may not be broken in a picking substrate in the case of the last substrate division has the problem of being very difficult. This invention tends to solve the above-mentioned problem, and division is easy and it aims to let it offer the manufacture approach of a thick-film-wiring substrate that the thick-film-wiring substrate excellent in dependability can be obtained.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the description on the configuration of invention concerning above-mentioned claim 1 A photolithography processes which prepare a predetermined resist pattern in the front-face side of a metallic thin plate, The plating process which prepares the electric conduction film in parts other than the resist pattern by the side of the front face of a metallic thin plate by the galvanizing method, The 1st insulator layer formation process which covers the 1st insulator layer and is fixed to the front-face side of a metallic thin plate centering on the electric conduction film, The metallic-thin-plate removal process of removing a metallic thin plate and preparing circuit pattern mold goods, The 2nd insulator layer formation process which prepares the 2nd insulator layer which has an adhesive property in the metallic-thin-plate removal side of circuit pattern mold goods, The laminating process which carries out the laminating of the circuit pattern mold goods of two sheets which prepared the 2nd insulator layer by piling up the 2nd insulator layer, and is made to fix, The through hole formation process which establishes a through hole in the predetermined part of the electric conduction film of the upper and lower sides of circuit pattern mold goods by which the laminating was carried out, It is in having formed the through hole flow process of preparing a conductor layer in a through hole and making it flowing through the up-and-down electric conduction film, and the electrode formation process to which a part of insulator layer is removed and the electric conduction film of an electrode location is exposed.

[0006] Moreover, in the manufacture approach of said thick-film-wiring substrate according to claim 1, the description on the configuration of invention concerning above-mentioned claim 2 forms the 1st insulator layer and the 2nd insulator layer with electropainting, and is to have been made to perform immobilization of this 1st insulator layer and the 2nd insulator layer by heating baking.

[0007]

[Function and Effect of the Invention] He is trying to support the electric conduction film after removing a metallic thin plate by the 1st insulator layer in invention concerning claim 1 constituted as mentioned above by covering the 1st insulator layer and carrying out adhesion immobilization a core [ the electric conduction film ], after preparing the electric conduction film in the front-face side of a metallic thin plate. A laminated circuit board is obtained by preparing the 2nd insulator layer which has an adhesive property, carrying out the laminating of the circuit pattern mold goods of two sheets to the side which removed the metallic thin plate of these circuit pattern mold goods, and making it fix to it by the 2nd insulator layer. And it is made to flow through between the predetermined electric conduction film of the upper and lower sides of a laminated circuit board through a through hole, and an electrode terminal is prepared by removing the 1st insulator layer for an electrode terminal area further. Consequently, it is not necessary to do the punching activity by which the electric conduction film is hardly prepared and which used much metal mold for division of a picking substrate since many 1st and 2nd insulator layers were hardly prepared in the division part of a picking substrate, and the easy activity of only separation, such as electric conduction film, can perform. Furthermore, since a substrate does not receive damage according to separation, the dependability of a thick-film-wiring substrate is raised. Moreover, since the 1st insulator layer and the 2nd insulator layer serve also both as the object for electric conduction film protection, and adhesives with the object for electric conduction film support, they do not need to prepare a protective coat and an adhesives layer separately.

[0008] Moreover, it is [0009] from which the effectiveness that many coatings cannot deposit in a picking substrate in a division location, and a substrate can be separated easily is acquired in invention concerning claim 2 constituted as mentioned above since an electrodeposition paint deposits only on the electric conduction film by having been made to perform formation of the 1st insulator layer and the 2nd insulator layer with electropainting and it does not deposit in an insulating part therefore.

[Example] Hereafter, a drawing explains one example of this invention. Drawing 1 shows roughly the stator components of the monotonous mold motor which applied this invention. This stator component 10 is the thick-film-wiring substrate of the shape of a circular ring with an outer-diameter [ of 35mm ] phix bore [ of 6mm ] phix thickness of 0.5mm, the electrode terminal area 11 was formed in the part by the side of a periphery, the nine coil sections 12 by which the division-into-equal-parts rate was carried out are formed in the range of central 30mmphi, and, as for the outside of the coil section 12, the outer frame section 13 is formed. The coil section 12 is divided into A polar zone 12a which separated two 40-degree adjoining pieces at a time, and prepared them 3 sets, and B polar zone 12b which separated one 80-degree piece at a time, and prepared it three pieces. A polar zone 12a is connected to outside terminal 11a of the electrode terminal area 11, and B polar zone 12b is connected to inside terminal 11b of the electrode terminal area 11. A monotonous mold motor makes the Rota components (not shown) which arranged N pole and the south pole for 12 magnets by turns counter the stator components 10, and is formed.

[0010] Below, the production process of the thick-film-wiring substrate containing the coil section 12 and the electrode terminal area 11 is explained. First, the aluminum plate 20 with a thickness of 0.1mm is prepared, and the photoresist film 21 of a predetermined pattern is formed in the 1 front-face side of this aluminum plate 20 with a photolithography techniques (refer to drawing 2 (a)). Any of a positive type and a negative mold are sufficient as it, although any of a liquid or a film are sufficient as a photoresist, adhesion with an aluminum plate 20 is good, and it needs to have the property of not exfoliating in plating liquid.

[0011] Next, after carrying out surface treatment, such as a zinc permutation, to the photoresist forming face of an aluminum plate 20, the copper-plating layer 22 is formed with electroplating (refer to drawing 2 (b)). A copper-sulfate solution is used as plating liquid, and it is current density 20 A/dm<sup>2</sup>. The plating layer of 60 micrometers of thickness is obtained by performing plating for about 15 minutes. Next, with electropainting which used epoxy system resin for the copper-plating forming face of an aluminum plate 20, form the coating film 23 with a thickness of 20-40 micrometers, and it can be burned by heat-treating the coating film 23 by 180-degreeC further, and is made to harden, and adhesion with the copper-plating layer 22 is strengthened (refer to drawing 2 (c)). Here, since the coating film 23 by electropainting grows up to be the perimeter of the copper-plating layer 22, the coating film is formed only in the part in which much lead wire for copper plating is prepared in the parting line location in the picking substrate. Furthermore, an alkaline etching reagent removes the aluminum plate 20 for support, and the pattern plating mold goods A are obtained (refer to drawing 2 (d)). Since it is fixed to the coating film 23 and the copper-plating layer 22 has hardened the coating film 23 by baking at this time, the pattern plating mold goods A are maintaining the monotonous configuration.

[0012] Copper-plating layer 22a is prepared in the copper-plating layer 22 exposure part of these pattern plating mold goods A with electroplating (refer to drawing 2 (e)), and it is made to reduce resistance of a copper-plating layer according to the same conditions as the above. And the coating film 24 is formed in a copper-plating layer 22a exposure according to the same conditions as the above with electropainting (refer to drawing 2 (f)). And by burning [ the pattern plating mold goods A of two sheets which formed the coating film 24 ] a coating for coating film 24 forming face in the state of [ this ] lamination (referring to drawing 3 (g)), carry out the laminating of both the pattern plating mold goods, and it is made to unify, and considers as the pattern plating laminate B (refer to drawing 3 (h)).

[0013] In order to make it flow through the vertical copper-plating layer 22 of a predetermined part of the two-layer copper-plating layers 22 of the pattern plating laminate B, a perforating process is carried out with a drill etc., a through hole 25 is formed (refer to drawing 3 (i)), copper-plating layer 25a is further prepared in a through hole 25 with electroplating, and it is made to flow through between the up-and-down copper-plating layers 22 (refer to drawing 3 (j)). Furthermore, a thick-film-wiring substrate is obtained by excimer laser processing's removing the coating film 23 of the input terminal section location of the pattern plating laminate B, exposing the copper-plating layer 22, and forming an electrode terminal 26 (refer to drawing 3 (k)). And a thick-film-wiring substrate is divided into the thick-film-wiring substrate classified by each by separating a part for the lead line part for electroplating.

[0014] As explained above, the above-mentioned thick-film-wiring substrate also achieves the function of the cover coat which protects a copper-plating layer by having constituted the base material which supports the electric conduction film with the coating film by electropainting while the coating film achieves the function of adhesives. Therefore, since adhesives and a cover coat agent become unnecessary, ingredient cost is reduced, and the time and effort of spreading of adhesives and a cover coat agent can be saved, and a manufacturing cost can also be reduced. Moreover, since the coating film is formed focusing on a copper-plating layer, a coating can hardly deposit into the separation part of the many picking substrate connected with the lead wire for electroplating, therefore the separation to each wiring substrate can be easily performed with scissors etc. not using metal mold etc. Consequently, the dependability of a wiring substrate is raised, without damage arising in a substrate by separation.

[0015] In addition, in each above-mentioned example, although the coating film of the epoxy system by electropainting is used, it may not restrict to electropainting and the photoresist film by the photolithography method may be used. Moreover, the film of organic system ingredients, such as polyimide film, other than the coating film of an epoxy system may be used. Moreover, not only a copper-plating layer but other metal plating layers or vacuum evaporation film etc. may be used as a conductor layer. Furthermore, in each above-mentioned example, although this invention is applied to manufacture of the stator section of a monotonous mold motor, you may apply to a small coil and high density connector, a high density wiring substrate, etc.

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[Translation done.]

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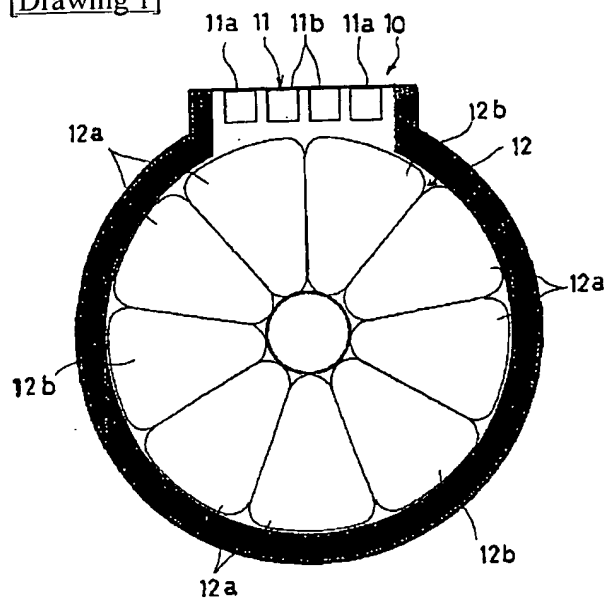
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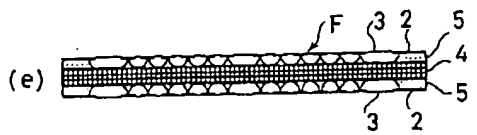
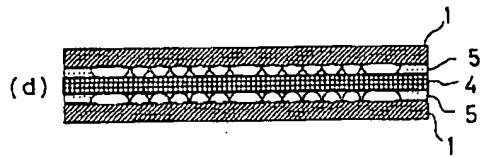
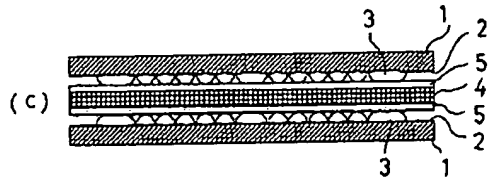
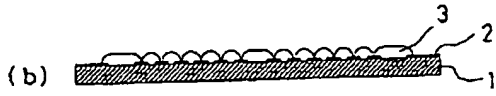
DRAWINGS

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[Drawing 1]

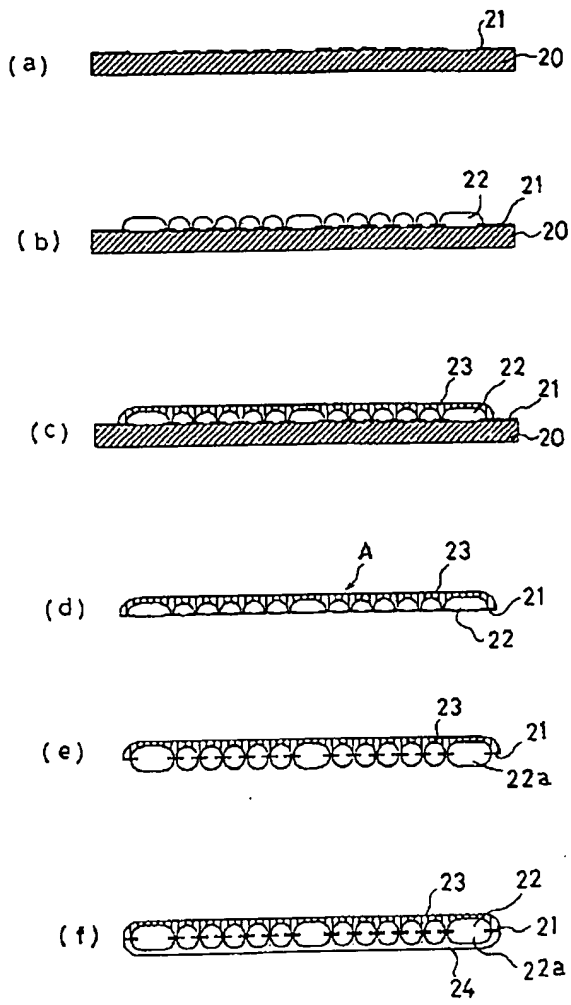


[Drawing 4]

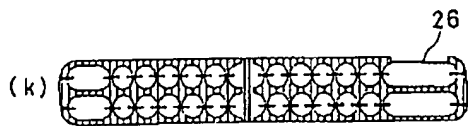
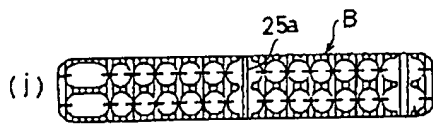
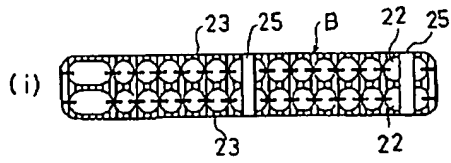
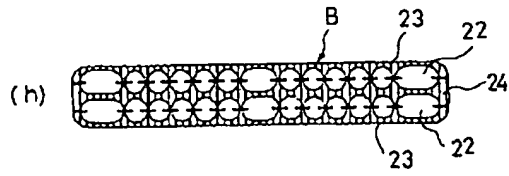
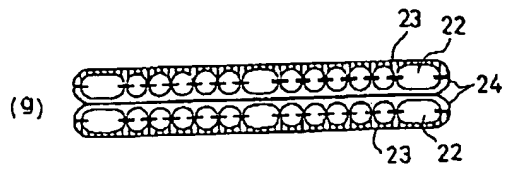


[Drawing 2]





[Drawing 3]



[Drawing 5]

